# Optimal Order Types
## for intraday US equities trading

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# About Me

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# Order types optimization is not just for HFT

- Most intraday trading strategies are sensitive to issues of:
  - Gaming by HFT
    - 70% of US equity market volume due to HFT. (zerohedge.com 2010)
  - Adverse selection.
  - Information leakage.
  - Mini flash crashes and withdrawal of liquidity.
  - Thin top of book liquidity.
    - Typical NBBO size is 100x100 for most liquid stocks.
  - Order types, smart routing, and dark pool selection.

# Gaming by HFT: Front-running

▸ HFT will be first to take out any price improvements by liquidity providers.

▸ Hence slower liquidity takers (market orders) can seldom enjoy price improvements.

▸ Nothing much we can do as slow traders to benefit from price improvements.

▸ But at least we should backtest our strategies with level 2 ("depth of book") quotes, instead of just NBBO ("top of book") quotes.

# Gaming by HFT: Ticking

▸ HFT will be first to offer liquidity and receive rebates ahead of other market makers.
▸ HFT places buy order at best bid + 1 tick if bid size ≫ ask size.
▸ Once filled, place sell order at best ask − 1 tick.
  ◦ If sell order not filled, sell at original best bid.
▸ Effect on slow market makers' orders: take longer to get filled and suffer opportunity cost and adverse selection.
▸ In case of US equities market, broker-affiliated HFT can place sub-penny orders in certain dark pools to "improve" slow market makers' displayed order by less than a tick.

# Gaming by HFT: Stop Hunting

- Support and resistance levels often well-known, often at round numbers.
  - E.g. $17.00 instead of $17.15.
- Stop orders often cluster at these levels.
- HFT can submit large sell orders near support level so price drops below support.
- Sell stop orders are triggered.
- Price drops further.
- HFT buy covers.
  - Ref. Osler, Carol. 2000. Support for Resistance: Technical Analysis and Intraday Exchange Rates. Federal Reserve Bank of New York Economic Policy Review 6 (July 2000): 53-65.

# Stop Hunting: remedy

- Avoid leaving stop orders with brokers.
- Avoid stop prices at round numbers or well-known support/resistance levels.
- Use software to exit positions piecemeal, over extended period, for risk management.

# Gaming by HFT: Hide and Light

- "Hide and light" orders
  - A special order type that is used to gain time priority over our limit orders.
  - First placed as hidden order that will lock an away market (permitted by Regulation NMS).
  - Example (Ref. BATS Display-Price Sliding flyer)
    - NBBO=$10.00 x $10.01
    - BATS BBO=$10.00x$10.02
    - A bid on BATS book at 10.01 will be Display-Price slid to 10.00, but has a hidden working price of 10.01
    - When NBBO offer lifts to 10.02 or higher, bid will be unslided and redisplayed at 10.01, maintaining priority.

# Gaming by HFT: Hide and Light

▸ Why is this an advantage to HFT?
- ◦ Buying at original NBO ($10.01) would cost a taker's fee. Buying at new NBB ($10.01) will *earn* rebate.
- ◦ No need to cancel and replace orders to remain at top-of-book and maintain priority of hidden order.
- ◦ HFT can take advantage of slower SIP (Securities Information Processor) feed (*i.e.* consolidated feed) relative to direct feed from exchanges.
  - • SIP feed is used to determine whether market is locked.
  - • SIP feed slower than direct feed by 10-15ms.
  - • (However, see Shengwei Ding *et al* "How Slow is the NBBO?" which indicates delay is only 2 ms for very active stocks in 2013.)
  - • HFT can determine actual market not locked and place Hide-and-light order to step ahead of our orders.

# Gaming by HFT: Queue-Jumping

‣ Using DAY Intermarket Sweep Orders to queue-jump existing orders during fast markets.

‣ See later discussion on DAY ISO.

# Order Types Optimization

▸ Are there remedies available to traders who do not want to be disadvantaged by HFT?

▸ Yes: can consider these order types:

- Immediate Or Cancel (IOC) order
- Intermarket Sweep Order (ISO)
- Hide and light order
- DAY ISO

# Immediate Or Cancel (IOC) order

- A hybrid between market and limit order.
- Like a limit order, it will not execute at worse price than limit price.
- Like a market order, if it is not immediately executable, it will be automatically cancelled.
- A good order type to use to prevent **Adverse Selection**.

# Sidebar: Adverse Selection

▸ When a limit order only gets filled when the price usually moves against our position subsequently.

▸ Cause: the counterparties are **informed traders**, with superior information / short-term price prediction models.

▸ Such orders from informed traders often called "toxic order flow", and they frequently utilize market or IOC orders.

▸ Our IOC orders won't interact with their market/IOC orders.

# IOC order

▸ Use IOC instead of limit orders to avoid adverse selection.

▸ In effect: give up "market-making" in the equities market unless you are a HFT!

  ◦ By "market-making", we meant strategies that attempt to earn market-making rebates, and those that try to earn bid-offer spreads.

  ◦ We can still "make-market" for long-term liquidity provisions while avoiding short-term adverse selection.

# Intermarket Sweep Order (ISO)

- An order modifier applied to IOC orders.
- When sent to an exchange or trading venue "L", no routing to another ("away") venue "N" is required even if NBBO is over at "N".
  - "L" – Local, "N" – NBBO
- ISO can immediately sweep order book at "L".
- Trader herself is responsible for sending other parts of parent order to "N" and other away venues if they have better top-of-book quotes to comply with Reg NMS Rule 611, the Order Protection Rule.

# Intermarket Sweep Order (ISO)

- Useful when
  - Order size > NBBO size
  - When venue "L" is "fast" : NBBO (based on slow SIP feed!) from "slower" trading venues may be outdated.
    - Routing to venue "N" induces latency.
  - There may be undisplayed quotes at "L" better than NBO at "N".

# Intermarket Sweep Order (ISO)

▸ E.g.

"L" has offers          "N" has offers

$10.5: 1000

$10.3: 500

$10.2: 100 (NBO)

Given a buy limit order of 600 @ $10.3, buyer is better off submitting ISO order to "L" instead of having 500 shares routed to "N", as long as she also separately sends buy order of at least 100 to "N".

# Intermarket Sweep Order (ISO)

▸ If we do not use ISO, in fast markets we may be taken advantage of by HFT who has direct feeds from exchange.

  ◦ NBBO prices may be stale due to slow SIP data feeds.

  ◦ Supposedly marketable orders sent to NBBO venue may be rejected.

  ◦ ISO enjoy simultaneous "parallel processing" at multiple venues.

# Drawback of ISO

▸ There is also *danger* in using ISO orders.

▸ There may be displayed quotes *below* top of book at "N" *better* than book prices at "L".

▸ Using ISO may execute at inferior prices while sweeping order book at "L".

▸ E.g.

| "L" has bids | "N" has bids |
|---|---|
| | $9.99: 100 (NBB) |
| $9.98: 300 | |
| | $9.96: 600 |
| $9.95: 300 | |

▸ A ISO Sell order at $9.95 for 600 shares sent to "L" coupled with market order for 100 sent to "N" will be filled at worse price than a market order for 700 shares routed to "N"

# Hide and light order

- E.g.
  - Display-Price Sliding on BATS
  - Price-to-Comply on Nasdaq
  - Post No Preference Blind on NYSE ARCA
- When to use them:
  - If you want to provide liquidity and earn (high?) rebates at specific venue.
  - If you want to remain at top-of-book.
  - If you want to maintain time/queue priority.
  - If your order will lock current market, but you expect market to move away and unlock it.

# DAY ISO

▸ Again, a limit order, but has time-in-force for trading day instead of IOC.

▸ Once order book of a venue has been swept, remaining unfilled portion will rest as limit order at top of book for rest of day.

▸ If you can show, via fast direct feed, that an away "locked" market is in fact unlocked, limit order will be displayed immediately while hide-and-light orders will remain hidden (with lower priority) until slower SIP feed unlocks away market.

# DAY ISO

- "Queue jumping"
  - Used this way, DAY ISO can queue-jump orders arrived at venue at same price but earlier in time.
    - Earn rebates!

# Conclusion

▸ HFT has disadvantaged executions of conventional order types, for either market taker or maker.

▸ Slow traders need to make use of newer, exchange-custom-made order types to preserve execution quality.

| Purpose | Order |
|---|---|
| Avoid adverse selection | Immediate-or-cancel (IOC) |
| Immediate execution | Intermarket-sweep-order (ISO) |
| Make market and earn rebate | Hide-and-light, Day ISO |
| Risk management | Algorithmic stop orders |

# Keep in touch!

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